Nikon

# Chart projector NP-3S•3SV

## Repair Manual

Nikon

NIKON CORPORATION

TOKYO, JAPAN

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|---|---|---|
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[Explanation of Symbol on this manual]

| Symbol | Meaning | Symbol | Meaning |
|---|---|---|---|
| ⊕ | Philips type | | Pan head |
| ⊖ | Slotted head | | Countersunk head |
| ◎ | Hexagonal box | | Oval countersunk head |
| ⬡ | Hexagonal head | | Truss head |
| T | Tool be used | | Cone point |
| L | Lubricating oil | | Half point |
| A | Adhesive | | Round point |
| | | | Flat point |
| | | | Pan head tapping screw |
| | | ◎ | Small size |
| | | ◎ | Normal size |
| | | ◎ | Spring |

〔1〕 General

The NP-3S is improving unit of the NP-3. The features are,

1) Change the chart design.

2) Speed up of the chart disc and mask rotation.

3) Over ray function of red and green filter.

〔2〕 Composition

1) Main unit and chart disc.

There are seven variations according the combination of the chart disc and projection lens.

| No. | Product cord | Chart disc | Projection lens | Mask | Controller |
|---|---|---|---|---|---|
| 1 | DCA20900 | Kana-landolt 1.0 | Single focus | Gray(HT) | Exclusive |
| 2 | DCA20901 | European multi 1.0 | Single focus | Gray(HT) | Exclusive |
| 3 | DCA20902 | Number 1.0 | Single focus | Gray(HT) | Common w/No. 4 |
| 4 | DCA20903 | Snellen 1.0 | Single focus | Gray(HT) | Common w/No. 3 |
| 5 | DCA20904 | Snellen-number 20/20 | Single focus | Gray(HT) | Common w/No. 7 |
| 6 | DCA20910 | Multiple 20/20 | Variable focus | Black(NT) | Exclusive |
| 7 | DCA20911 | Snellen-number 20/20 | Variable focus | Gray(HT) | Common w/No. 5 |

( HT: Half transparency, NT: Non-transparency )

2) Remote controller

Five kinds of variations. It corresponds to the installed chart disc.

Number 1.0 and Snellen 1.0 are using the same controller. All controllers have same functions except the label design.

NP-3's controller has the same functions except Red-green over ray.

3) Light bulb

DXA30125 6V-20W Halogen bulb ( made by NARVA )

4) Main unit dust cover

TYPE 508 Single focus model, TYPE 508-1 Variable focus model

5) Fuse

Normal blow type 1A-250V

6) Power cord

| | | |
|---|---|---|
| (1) For Domestic | 100V | DDB20200 |
| (2) For America | 120V | DDB20201 |
| (3) For Europe | 220V | DDB20202 |
| (4) For Australia | 240V | DDB20203 |

7) Options

| | |
|---|---|
| (1) Screen plate | DCB20820 |
| (2) Wall mounting arm | DXE35068 |
| (3) Floor stand | DXA30129 |

(4) Optional chart — DCB20804~20809,
DCB20812~20819,
DCB20822~20828 Total 21 kinds.

(5) Remote controller

① For domestic — DXA30200

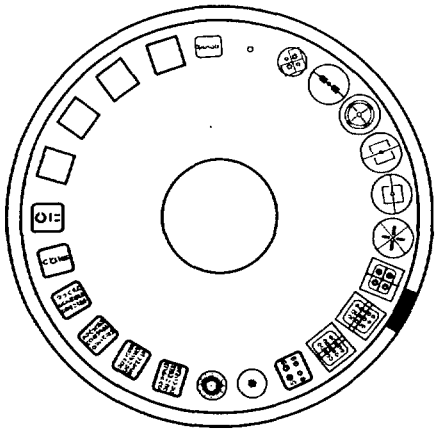
② For export — DXA30194 ( European multi )
DXA30195 ( Snellen/number 1.0 )
DXA30196 ( Snellen/number 20/20 )
DXA30197 ( Multiple )

〔3〕 Specifications

A. Principal

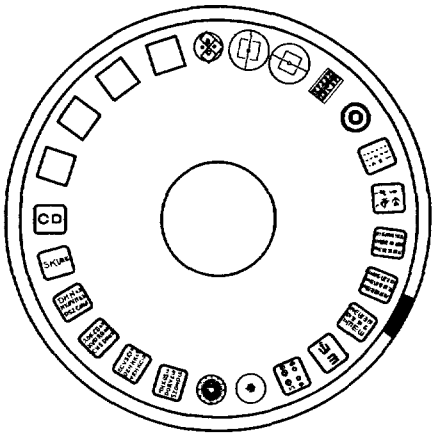
1) Chart disc (1 type for Domestic, 5 types for Export, Total 6 types )

(1) Kana/Landolt 1.0 for domestic. ( Decimal point letter, DCA20900 )



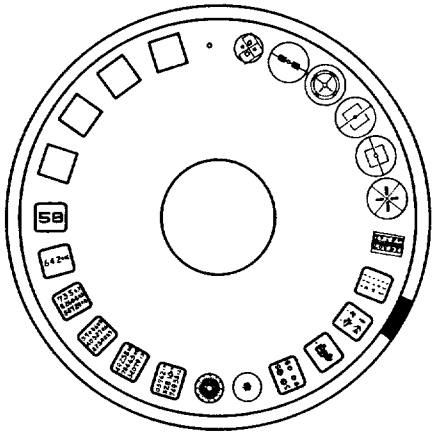
Kana, Landolt letter chart ( V.A. 0.1~2.0 )
Astigmatic dial chart ( 10° steps )
Cross cylinder dots chart
Red and green chart
Binocular balance chart (V.A. 0.5~1.5 )
Polarized red and green chart
Muscle balance chart
Coincidence test chart
Cyclotropia test chart
Stereoscopic vision test chart
Worth's four-dot test chart
Fixation spot chart
One vertical line letter chart

(2) European multiple chart 1.0 ( Decimal point letter, DCA20901 )



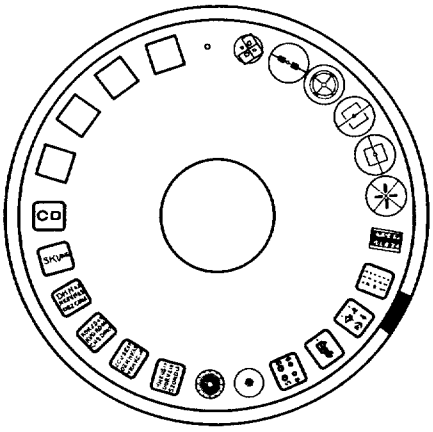
Snellen (English) letter chart (V.A. 0.1~1.2)
Astigmatic dial chart ( 10° steps )
Cross cylinder dots chart
Red and green chart
Letter E chart (V.A. 0.1~1.0)
Children's chart (V.A. 0.2~1.0)
Schober test chart
Binocular balance chart
Coincidence test chart
Worth's four-dot test chart

(3) Number chart 1.0 ( Decimal point letter, DCA20902 )



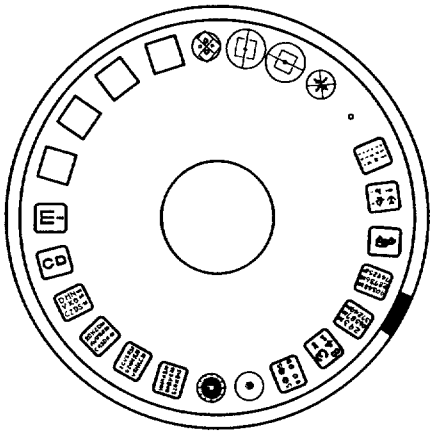
Number chart (V.A. 0.1~1.2)
Astigmatic dial chart ( 10° steps )
Cross cylinder dots chart
Red and green chart
Children's chart (V.A. 0.1~1.0)
Binocular balance chart
Muscle balance chart
Coincidence test chart
Cyclotropia test chart
Stereoscopic vision test chart
Worth's four - dot test chart
Fixation spot chart

(4) Snellen chart 1.0 ( Decimal point letter, DCA20903 )



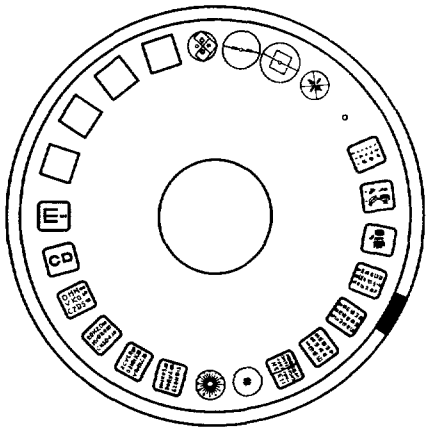
Snellen (English) letter chart (V.A. 0.1~1.2)
Astigmatic dial chart ( 10° steps )
Cross cylinder dots chart
Red and green chart
Children's chart (V.A. 0.1~1.0)
Binocular balance chart
Muscle balance chart
Coincidence test chart
Cyclotropia test chart
Stereoscopic vision test chart
Worth's four - dot test chart
Fixation spot chart

(5) Snellen/number chart 20/20 ( Fraction letter, DCA20903 )



Snellen (English) letter chart (V.A. 400~15)
Astigmatic dial chart ( 15° steps )
Cross cylinder dots chart
Red and green chart
Number chart (V.A. 200~20)
Children's chart (V.A. 200~20)
Fixation spot chart
Muscle balance chart
Coincidence test chart
Worth's four - dot test chart

(6) Multiple chart 20/20 ( Fraction letter, DCA20903 )



Snellen (English) letter chart (V.A. 400~15)
Astigmatic dial chart ( 15° steps )
Cross cylinder dots chart
Red and green chart
E letter chart (V.A. 100~20)
Children's chart (V.A. 200~20)
Fixation spot chart
Muscle balance chart
Coincidence test chart
Stereoscopic vision test chart
Worth's four-dot test chart

(7) Common features

| | |
|---|---|
| ① Chart number | 20 kinds + 4 kinds (option) |
| ② Rotation speed | 0.1 sec. per frame or faster |
| ③ Rotation direction | Clockwise and counter-clockwise both direction |
| ④ Optional chart | A maximum of four optional charts can be added. |

2) Mask disc

(1) Painting color

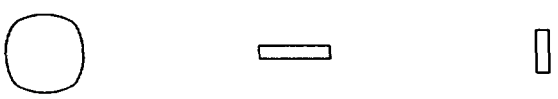
There are two colors.

① Half-transparency Gray (65%~70% transparency)
For DCA20900, DCA20901, DCA20902, DCA20903, DCA20904, DCA20911.

② Non-transparency Black
For DCA20910

(2) Mask shape

| | |
|---|---|
| ① Single letter mask | 15 kinds ( 3 × 5 ) |
| ② Horizontal line mask | 3 kinds ( Upper, middle, Lower lines ) |
| ③ Vertical line mask | 5 kinds ( Five columns ) |
| ④ Over-ray red-green filter | 1 pair ( Over-ray test can be done ) |
| ⑤ Rotation speed | 0.1 sec. per frame or faster |



Single letter Horizontal Vertical

Mask shape (Unequal magnification)

3) Projection distance and magnification

(1) Single focus type

| Projection distance | Magnification |
|---|---|
| 6.1 m | 29.3 x |
| 6.0 m | 28.8 x |
| 5.0 m | 24.0 x |
| 4.0 m | 19.2 x |
| 3.0 m | 14.4 x |
| 2.9 m | 13.9 x |

(2) Variable focus type

| TEST distance | Magnification | Possible proj. distance |
|---|---|---|
| 3 m | 14.4 x | 2.9 ~ 3.7 m |
| 4 m | 19.2 x | 3.8 ~ 4.8 m |
| 5 m | 24.0 x | 4.7 ~ 5.9 m |
| 6 m | 28.8 x | 5.6 ~ 7.0 m |
| 20 feet | 29.3 x | 5.7 ~ 7.1 m |

4) Projection size

At 5 m distance and 24x magnification,

$\phi$240 ㎜, 240 mm × 16 mm, 180 mm × 216 mm.

5) Effective field of projection

At 5 m distance and 24x magnification,

$\phi$340 ㎜.

6) Brightness on the projection screen

130 cd/ ㎡ or more

7) Focusing system

Extension projection lens system

8) Light source

(1) 6V - 20W Halogen bulb ( made by NARVA )

(2) Changeable lamp voltage 6V or 6.3V by changing connector position on the PC board.

9) Remote controller

(1) Infrared rays (IR) light emitting wireless type.

(2) All operation is controlled with controller.

Chart selection, Light on & off, Mask selection, Programing,

Chart forward and backward advance

(3) Maximum of four controller can operate by combination of the main unit dip switches and controller's switch & jumper line.

(4) 37 keys operation

10) Programing operation

Two programing can be stored. Each programing has the maximum of 16 steps.

11) Operation sound

(1) By operating the controller key, the main unit sounds " Pi ".

(2) This sound is suppressible with the Dip switch No.3 on the PC board.

12) Main unit tilting

(1) Using the adjustable four legs.

(2) Adjustable range

Elevation ± 1 2° , Level ± 6° .

13) Installing screw hole

On the bottom. M6 screw hole. Two hole with 110mm span.

14) Overall dimensions

| | |
|---|---|
| Main unit | 325 x 194 x 175 mm |
| Controller | 176 x 64 x 18 mm |

15) Weight

| | |
|---|---|
| Main unit | 4.1kg |

16) Fuse specification

1A - 250V Two pieces use.

17) External control terminal

For wired controller

18) Power saving function

(1) Function - - - - Light bulb goes off.

(2) Condition - - - - No operation of controller for about ten minutes.

(3) This function is suppressible with the Dip switch No.8 on PC board.

19) Input voltage

| | |
|---|---|
| Voltage | 100V, 120V, 220V, 240V |
| Frequency | 50/60 Hz |

20) Power Consumption

| | |
|---|---|
| 0.6A | 100V / 120V |
| 0.3A | 220V / 240V |

B. Qualitative Characteristics

1) Focal length on single focus type

f = 200 ± 1 mm

2) Projection Magnification

24x ± 5% ( Over the entire visual field for a projection distance of 5 m )

3) Resolution

When the resolution chart is projected on the test screen at a projection distance of 5 m,

Center: 70 lines/mm

Peripheral: 50 lines/mm

4) Chart accuracy

(1) Chart size

Within ± 5 %

(2) Polarizing axis

45° ± 1°

5) Chart disc inclination

Within ± 1 5′ against disc axle.

6) Condition at chart changing

(1) Smooth

(2) Chart center offset (on the screen)

For a projection distance of 5 m,

Chart only within 6 mm for all direction.

Chart and Mask within 6 mm vertically, within 5 mm horizontally.

(3) No contact a chart and mask edge.

〔4〕 Necessary tool

1) General tools

| Name | Tool Number |
|---|---|
| (1) Philips screwdriver set (four pcs.) | T 91400 |
| (2) Standard screwdriver set (six pcs.) | T 91000 |
| (3) Philips screwdriver with wooden handle (M3) | T 91203 |
| (4) Philips screwdriver with wooden handle (M4) | T 91204 |
| (5) Allen key set (M3,M4,M6) | T 91200 |
| (6) Blower | T 5017 |
| (7) Tweezers Type AA | T 92041 |
| (8) Flat compass spanner | T 92161 |
| (9) Pin face compass spanner | T 92162 |
| (10) Pin face compass spanner with bent ends | T 92163 |
| (11) Compass spanner type D | T 35141 |
| (12) Lens tissue | EIG0042 |
| (13) Wooden stick | EIZ162 |
| (14) Handlap set | ELL00331 |
| (15) Grip rubber | J 5021 |

2) Special tool

| Name | Tool Number |
|---|---|
| (1) Socket adapter | J 39036 |

## 〔5〕 Lubricating oil and Adhesive

1) Lubricating oil

| House No. | Appearance | Brand name |
|---|---|---|
| G7910 | Brown | LOSOID 1150E/35019 (LOSIMOL) |

2) Adhesive

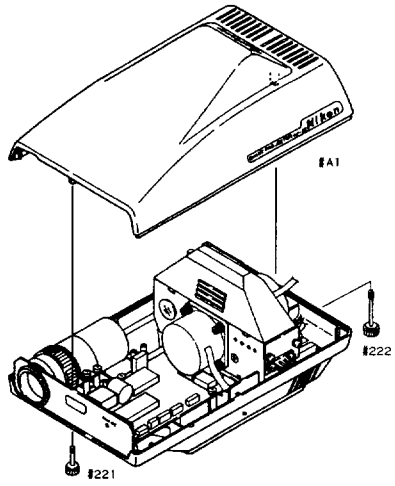
| House No. | Appearance | Brand name | Principal element |
|---|---|---|---|
| #350 | Clear | Screw lock (THREE BOND) | Vinyl acetate resin |
| #515 | White<br>Black | KE45W RTV (SHINETSU KAGAKU)<br>KE45B RTV (SHINETSU KAGAKU) | Silicone rubber |
| #616 | Clear<br>light yellow | Cemedine super (Cemedine) | Epoxy resin |
| #648 | Clear<br>light yellow | Cemedine #1590 Hi-super<br>(Cemedine) | Epoxy resin |
| #649 | Yellowish<br>brown | Araldite AW106 + HV953U<br>(Nippon Chiba Geigie) | Epoxy resin |
| #410 ST/L | Red | Locktite (Japan locktite) | Acrylic resin |

〔6〕 Precautions

1) Be sure to turn the power off and unplug the power cord before disassembly and part replacement.
2) Be sure to use Allen (hexagonal box) wrenches and screwdrivers of the appropriate sizes.
3) Be sure to clean the front chart disc surface with an ether - alcohol mixture when replacing the lens or mirror. Wipe the rear chart disc surface on which the color and pol arizing filter are mounted with a dry cloth without using an ether - alcohol mixture. The use of such mixture on this surface may cause damage, dissolving of adhesive or seepage.
   When wiping take care not to damage the rear surface.
4) The use of organic solvents (alcohol, ether, thinner) on visible plastic parts may cause discoloration or deformation. Soak lens tissue in a diluted neutral detergent and wipe these parts.
5) When exchanging the halogen lamp, allow the lamp to cool down before removal. Do not handle the lamp with bare hands in order to protect the lamp from finger prints. Should there be any finger prints or contamination on the lamp surface, wipe it clean with an ether - alcohol mixture.
6) Use only recommended adhesives and lubricating oil. Before using adhesive on parts clean and degrease them thoroughly. Stir two - part adhesives thoroughly to prevent an uneven mixture. Ensure the required curing time is maintained after adhering the parts.
7) Allow alcohol to seep sufficiently into a screw lock before attempting to unfasten a locked screw.
8) Parts numbers referred to herein are the reference numbers in the repair parts lists (GR - 6106, 6107). Always refer to these lists.

〔7〕 Disassembly procedure

1) Body cover



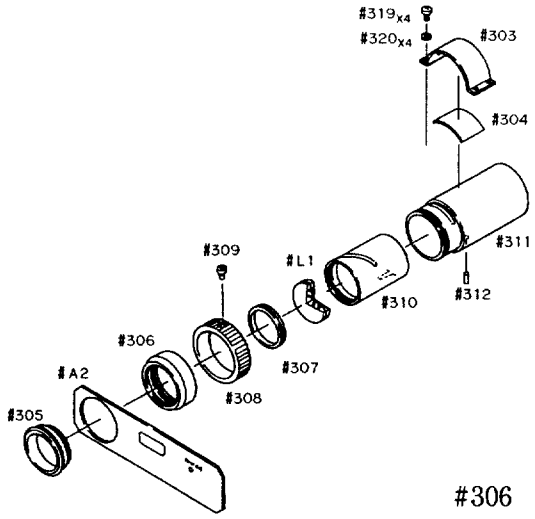

#A1 Body cover

⇩ #221, #222 Securing screw 2 pcs.

〈Note〉 Two screws are loosened only.
Can not remove them.

2) Projection lens

(1) Single focus lens




#305 Cover ring

⇩ 〈Note〉 Apply the alcohol between #306, and dissolve the adhesive.

⇩ T Flat spanner

#311 Projection lens tube

⇩ #319 ⊕ screw 3x6 4 pcs.

⇩

#303 Lens tube retaining plate

#304 Lens tube retaining rubber

⇩

#306 Cover ring mount

⇩ T Grip rubber

#308 Focusing ring

⇩ #309 Cam pin screw

⇩

#310 Projection lens case

⇩

#L1 Projection lens

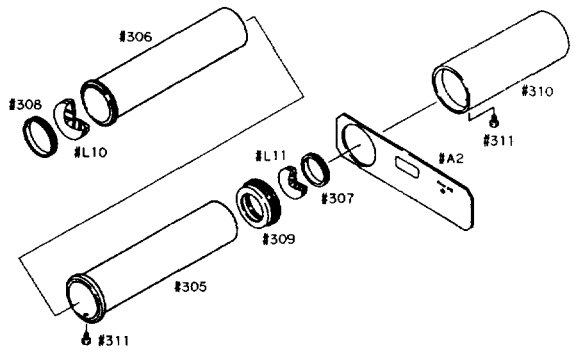
⇩ #307 Lens retaining ring

⇩ 〈Note〉 Apply the alcohol between #310, and dissolve

⇩ the adhesive.

⇩ T Flat spanner

(2) Variable focus lens



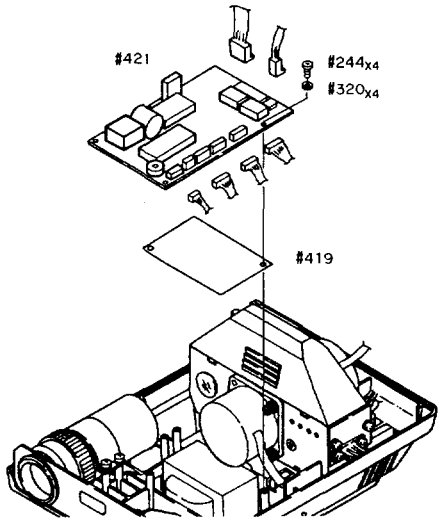

#305 Outer lens tube
⇩ #311 Fixing screw 1 pc. (Body side)
⇩ 〈Note〉 Just loosen.
⇩

#306 Inner lens tube
⇩ #311 Fixing screw 1 pc.
⇩ (Lens tube side)
⇩ 〈Note〉 Just loosen.
⇩

#L10 First projection lens
⇩ #308 L10 lens retainer
⇩ 〈Note〉 Apply the alcohol between #306,
⇩ and dissolve the adhesive.
⇩ T Flat spanner
⇩

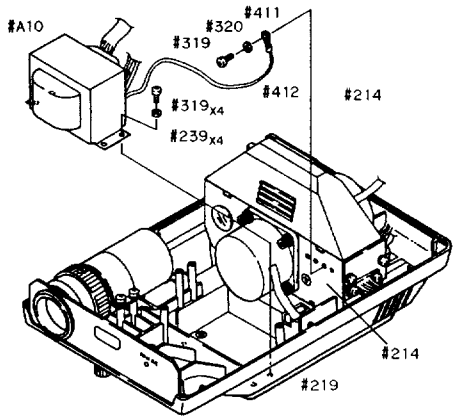
#L11 Second projection lens
⇩ #307 L11 lens retainer
⇩ 〈Note〉 Apply the alcohol between #309,
⇩ and dissolve the adhesive.
⇩ T Flat spanner
⇩ 〈Note〉 No need remove #309.

3) CPU & Memory board




Remove the six connectors from the CPU & Memory board
⇩
#421 CPU & Memory board
⇩ #244 ⊕ tapping screw ② 3x6 4 pcs.
⇩
#320 ◎ plane washer 3 4 pcs.
#419 Insulating sheet

4) Transformer




Do the job of " 3) CPU & Memory board ".

⇩

Remove the ground cable for the transformer.

⇩ #319 ⊕ screw 3x6 1 pc.

⇩

#320 ◎ plane washer 3 1 pc.

⇩

#A10 Transformer assembly

⇩ #319 ⊕ screw 3x6 4 pcs.

⇩

#239 ◎ plane washer 3 4 pcs.

5) Chart & Mask block

(1) Chart & Mask block assembly

Remove four connectors (chart & mask motors, sensor, lamp) from the CPU & Memory board

⇩

Remove three ground terminals from the chart & mask block.

⇩ #319 ⊕ screw 3x6 3 pcs.

⇩

#320 ◎ plane washer 3 3 pcs.

⇩

#225 Bottom plate

⇩ #319 ⊕ screw 3x6 2 pcs.

⇩ #244 ⊕ tapping screw ② 3x6 6 pcs.

⇩

#320 ◎ plane washer 3 8 pcs.

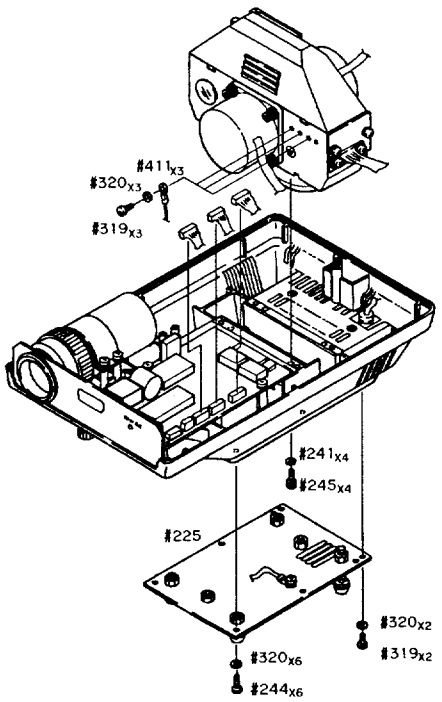
⇩

Chart & Mask block

⇩ #245 ◎ bolt 4x10 4 pcs.

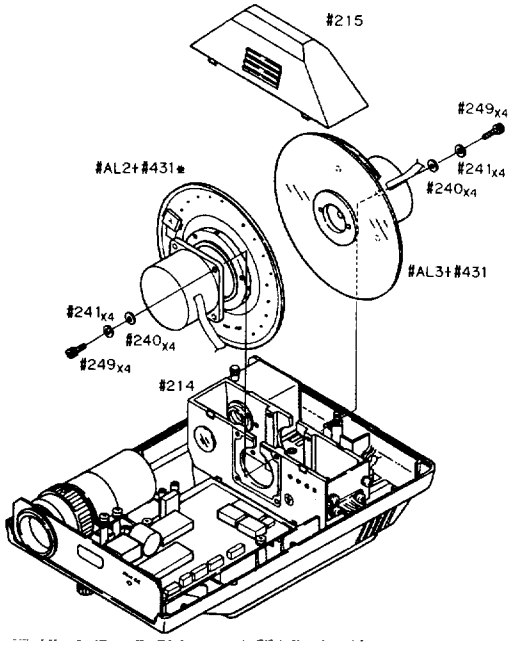
⇩

#241 ◎ spring washer 4 4 pcs.



(2) Chart & Mask assembly

〈Note〉 When removing the chart & mask assemblies, take care not to knock against the other parts.




#215 Chart & mask block cover

⇩

#AL3 + #431 Chart & motor assemblies

⇩ #249 ◎ bolt 4x12 4 pcs.

⇩

#240 ◎ plane washer 4 4 pcs.

#241 ◎ spring washer 4 4 pcs.

⇩

#AL2 + #431 etc. Mask & motor assemblies

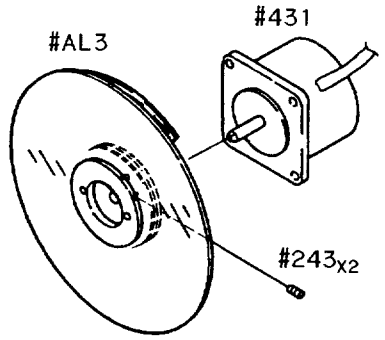
⇩ #249 ◎ bolt 4x12 4 pcs.

⇩

#240 ◎ plane washer 4 4 pcs.

#241 ◎ spring washer 4 4 pcs.

(3) Chart assembly

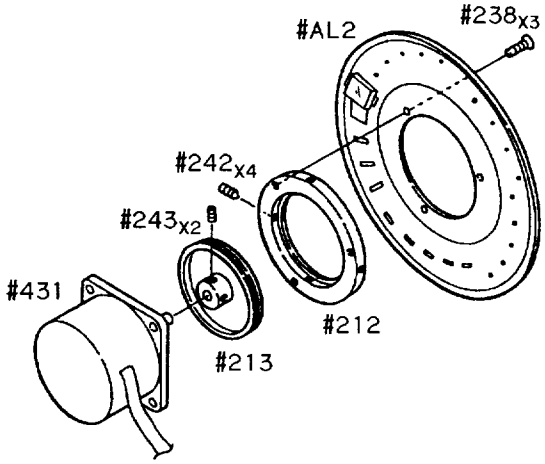



#AL3 Chart assembly

⇩ #243 ◎■ set screw 4x4 2 pcs.

⇩ 〈Note〉 Just loosen set screws.

(4) Mask assembly




#213 Motor pulley

⇩ #243 ◎■ set screw 4x4 2 pcs.

⇩ 〈Note〉 Just loosen set screws.

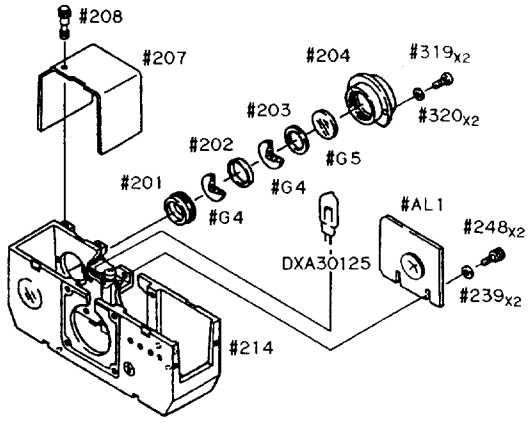
⇩

#AL2 Mask assembly

⇩ #238 ⊕▼ screw 3x6 3 pcs.

6) Lamp housing

(1) Condenser lens case




#207 Lamp housing cover

⇩ #208 Lamp housing cover screw

Remove the light bulb.

⇩ 〈Note〉 Make sure that the light bulb

⇩ becomes cool.

⇩ 〈Note〉 Do not touch the bulb directly

⇩ by fingers.

#204 Condenser lens case.

⇩ #319 ⊕ screw 3x6 2 pcs.

⇩ 〈Note〉 If you need, you may

⇩ remove the mirror

⇩ assembly (#AL1).

#320 ◎ plane washer 3 2 pcs.

⇩

Lenses (G4 & G5) and spacer (#202 & #203)

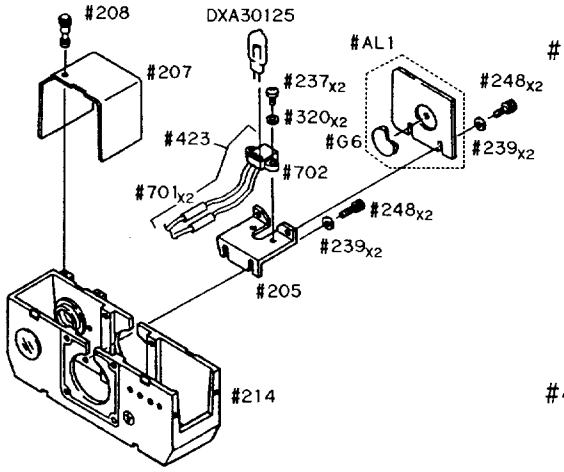
⇩ #201 Retaining ring

⇩ 〈Note〉 Apply the alcohol between #204, and

⇩ dissolve the adhesive.

⇩ T Flat spanner

(2) Lamp socket




#207 Lamp housing cover

⇩ #208 Lamp housing cover screw

Remove the light bulb.

⇩ 〈Note〉 Make sure that the light bulb

⇩ becomes cool.

⇩ 〈Note〉 Do not touch the bulb directly

⇩ by fingers.

#423 Lamp socket assembly

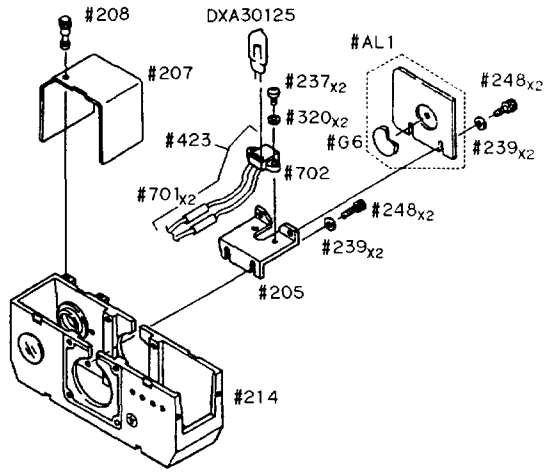
or #702 Lamp socket

⇩ #237 ⊕ screw 3x8 2 pcs.

⇩

#320 ◎ plane washer 3 2 pcs.

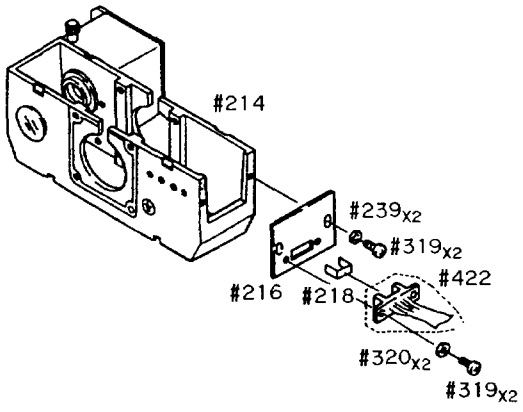
(3) Reflection mirror assembly




#207 Lamp housing cover
⇩ #208 Lamp housing cover screw
#AL1 Reflection mirror assembly
⇩ #248 ◎ bolt 3x6 2 pcs.
⇩
#239 ◎ plane washer 3 2 PCS.

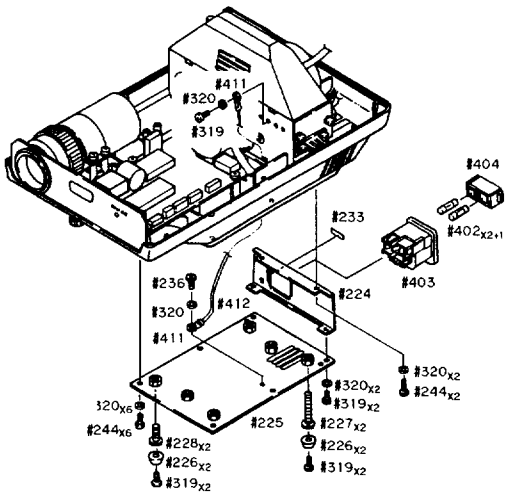
7) Sensor

Remove one connecter for the sensor from the CPU & Memory board.




⇩
#216 Sensor retaining plate
⇩ #319 ⊕ screw 3x6 2 pcs.
⇩
#239 ◎ plane washer 3 2 pcs.
⇩
#422 Sensor assembly
⇩ #319 ⊕ screw 3x6 2 pcs.
⇩
#239 ◎ plane washer 3 2 pcs.
⇩
#218 Sensor light shield plate
⇩ 〈Note〉 Be fixed on a sensor.

8) Bottom plate




#225 Bottom plate

⇩ #244 ⊕ Tapping screw ② 3x6 6 pcs.

⇩ #319 ⊕ screw 3x6 2 pcs.

⇩

#320 ◎ plane washer 3 8 pcs.

⇩

Remove the ground cable from the bottom plate.

⇩ #236 ⊕ screw 3x4 1 pc.

#320 ◎ plane washer 3 1 pc.

⇩

#224 Electro mount plate

⇩ #244 ⊕ Tapping screw ② 3x6 2 pcs.

⇩

#320 ◎ plane washer 3 2 pcs.

⇩

#403 AC receptacle

⇩ 〈Note〉 Push it outward with cramping the stopper.

#227 Height adjuster (long) 2 pcs.

#228 Height adjuster (short) 2 pcs.

⇩

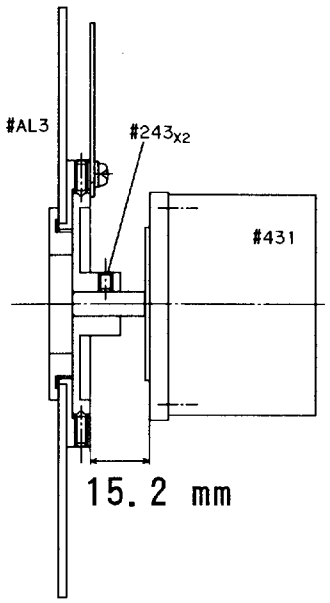
#226 Rubber cushion

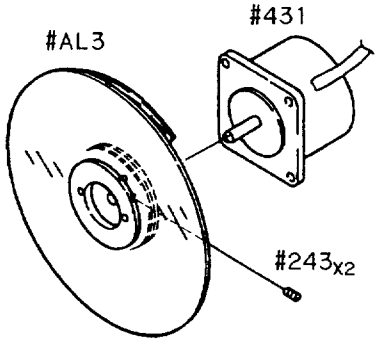
⇩ #319 ⊕ screw 3x6 1 pc.

〔8〕 Assembly procedure

1) Chart disc

The repair parts of chart disc is supplied only as a assembly.




#431 Motor assembly

⇩

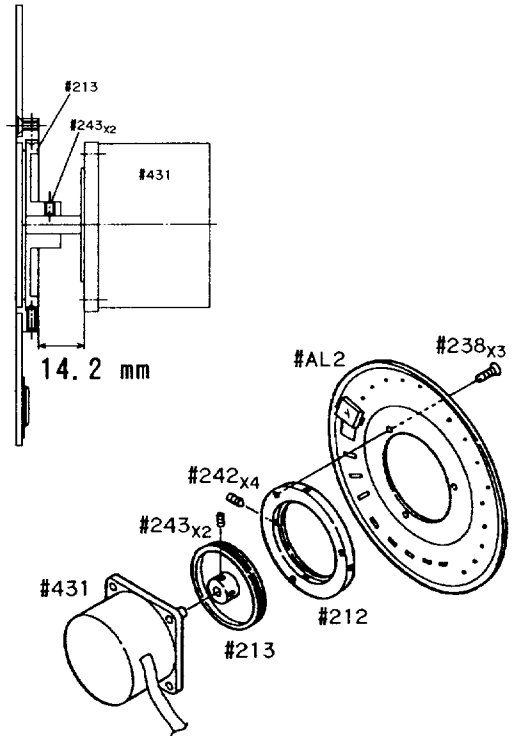
#AL3 Chart assembly

⇩⇦ #243 ◎■ set screw 4x4 2 pcs.

⇧ 〈Note〉 Secure a distance of left figure.

⇧ Ⓐ #350 (after adjustment)

2) Mask disc




#431 Motor assembly

⇩

#213 Motor pulley

⇩⇦ #243 ◎■ set screw 4x4 2 pcs.

⇧ 〈Note〉 Secure a distance of left

⇧ figure.

⇧ Ⓐ #350 (after adjustment)

⇩

#212 Mask disc retaining ring

⇩⇦ #242 ◎■ set screw 3x10 4 pcs.

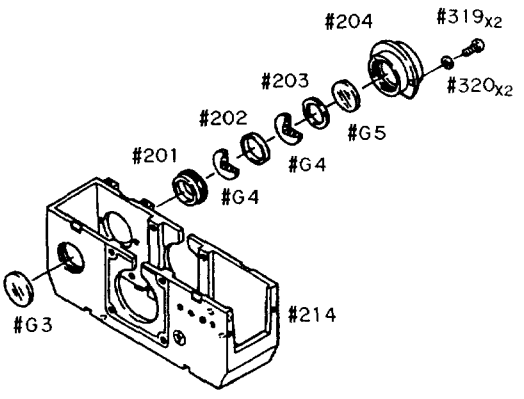
⇧ Ⓐ #350 (after adjustment)

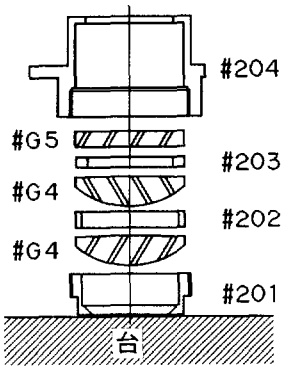
⇩

#AL2 Mask assembly

⇩⇦ #238 ⊕▼ screw 3x6 3 pcs.

3) Condenser lens




(lens case)

#201 Retaining ring

⇩

#G4 Condenser lens

⇩ 〈Note〉 Convex side faces down

#202 Spacer

⇩

#G4 Condenser lens

⇩ 〈Note〉 Convex side faces down

#203 Spacer

⇩

#G5 Heat insulation filter

⇩⇦ #204 Lens case

⇧ 〈Note〉 Put on the piled up above parts.

⇧ [T] Flat spanner

⇧ [A] #350 (after assembly)

---

#214 Motor mounting base

⇩

Lens case and lenses assembly

⇩ #320 ◎ plane washer 3 2 pcs.

⇩⇦ #319 ⊕ screw 3x6 2 pcs.

4) G3 glass plate

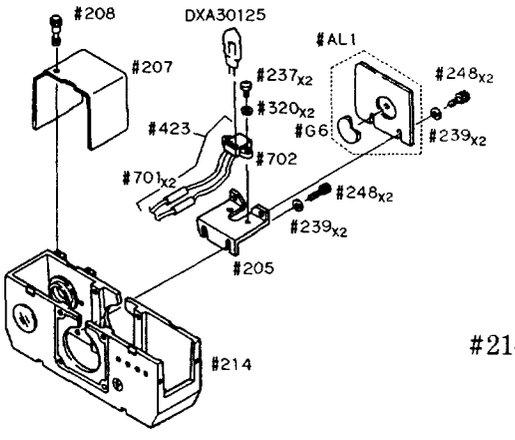
#214 Motor mounting base

⇩

#G3 Parallel flat glass plate

⇩ [A] #649 (three point bonded)

5) Lamp housing




#205 Lamp house bottom frame

⇩

#702 Lamp socket

⇩ #320 ◎ plane washer 3 2 pcs.

⇩⇦ #237 ⊕ screw 3x8 2 pcs.

⇧ Ⓐ #350 (after adjustment)

⇩

#214 Motor mounting base

⇩ #239 ◎ plane washer 3 2 pcs.

⇩⇦ #248 ◎ bolt 3x6 2 pcs.

⇧ Ⓐ #350 (after adjustment)

⇩

#AL1 Lamp house back frame

⇩ #239 ◎ plane washer 3 2 pcs.

⇩⇦ #248 ◎ bolt 3x6 2 pcs.

⇧ Ⓐ #350 (after adjustment)

⇩

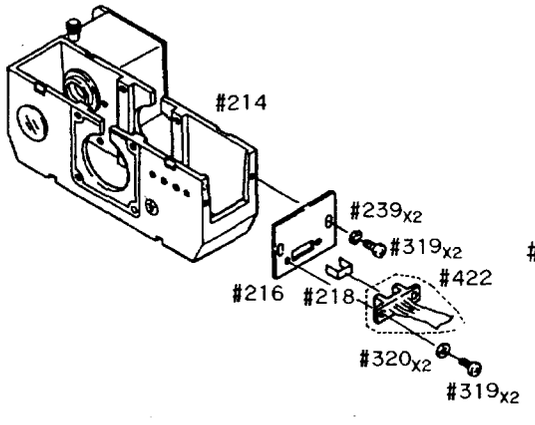
DXA30125 Light bulb

⇩ 〈Note〉 Do not touch the lamp by bare hand.

#207 Lamp housing cover

⇩⇦ #208 Lamp housing cover screw

6) Sensor (Photo interrupter)




#422 Cable assembly with Photo interrupter

⇩

#218 Sensor shielding plate

⇩⇦ Ⓐ #616 ( proper quantity,
Do not overflow )

#216 Sensor mounting plate

⇩ #320 ◎ plane washer 3 2 pcs.

⇩⇦ #319 ⊕ screw 3x6 2 pcs.

⇧ Ⓐ #350 (after adjustment)

⇩

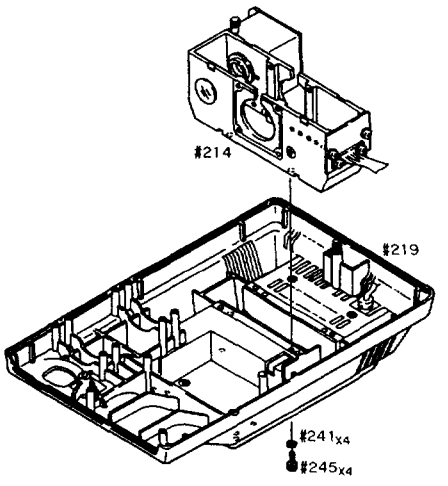
#214 Motor mounting base

⇩ #239 ◎ plane washer 3 2 pcs.

⇩⇦ #319 ⊕ screw 3x6 2 pcs.

⇧ Ⓐ #350 (after adjustment)

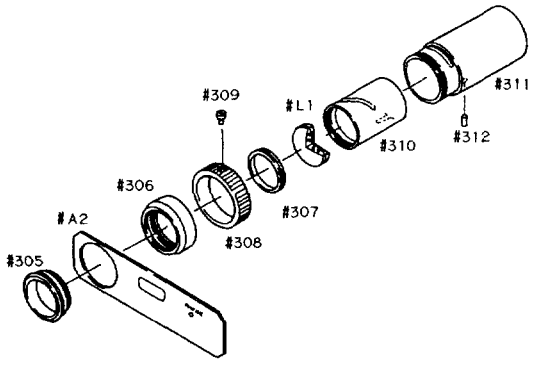
7) Chart & mask unit




#219 Unit base
⇩
#214 Motor mounting base
⇩ 〈Note〉 Do the same way for Chart & mask
⇩ assembled unit.
⇩ 〈Note〉 #G3 glass must face to the
⇩ projection lens side.
⇩ #241 ◎ spring washer 4 4 pcs.
⇩⇦ #245 ◎ bolt 4x10 4 pcs.
⇧ [A] #350 (after settling)

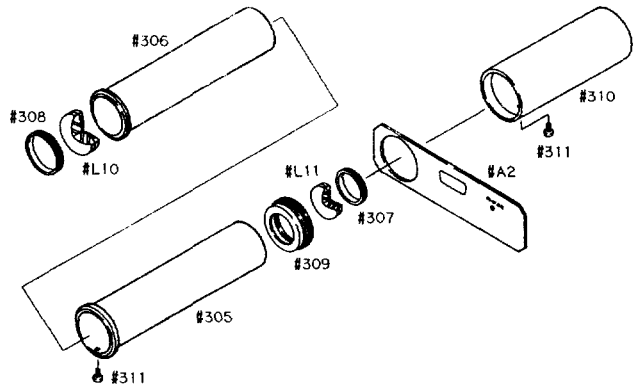
8) Projection lens

① Single focus lens




#310 Projection lens case
⇩ [L] G7910
⇩ 〈Note〉 Apply the grease outside of
⇩ tube after assembling the lens.
#L1 Projection lens
⇩ 〈Note〉 Wipe and clean it with a
mixture perfectly.
⇩⇦ #307 Lens retaining ring
⇧ [T] Flat spanner
⇧ [A] #350 (after tightening)
#311 Projection lens tube
⇩ 〈Note〉 Insert the pin #312 to the slit on
⇩ the projection lens case #310.
#308 Focusing ring
⇩ 〈Note〉 Align the screw hole on #308 with the slit
⇩ on #311 and the cam slit on #310.
⇩⇦ #309 Cam pin screw
⇧ [A] #350 (after tightening)
⇩
#306 Cover ring mount
⇩ [T] Grip rubber
#A2 Front cover plate
⇩⇦ #305 Cover ring
⇧ [T] Flat spanner
⇧ [A] #350 (after tightening)

② Variable focus lens




#305 Outer lens tube

⇩⇦ #309 #L11 lens case

⇧ T Flat spanner

⇧ A #350 (after tightening)

⇩

#L11 Second projection lens

⇩ 〈Note〉 Wipe and clean it with a mixture perfectly.

⇩⇦ #307 L11 lens retainer

⇧ T Flat spanner

⇧ A #350 (after tightening)

⇩

#306 Inner lens tube

⇩

#L10 First projection lens

⇩ 〈Note〉 Wipe and clean it with a mixture perfectly.

⇩⇦ #308 L10 lens retainer

⇧ T Flat spanner

⇧ A #350 (after tightening)

⇩

Insert the inner lens tube #306 to the outer lens tube #305.

⇩⇦ #311 Fixing screw

⇩ 〈Note〉 Tighten it lightly.

⇩

#A2 Front cover plate

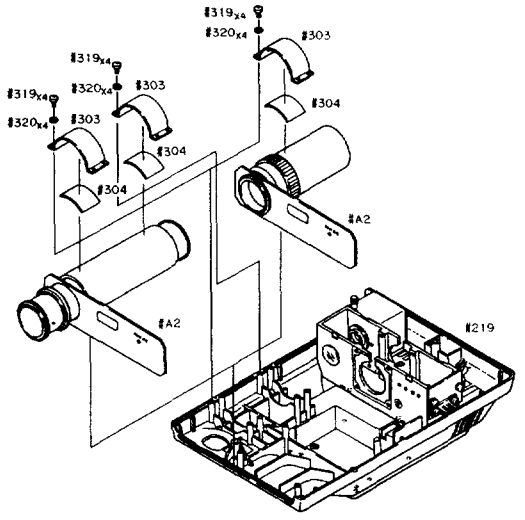
⇩

Insert the outer lens tube #305 to the projection lens tube #310

⇩⇦ #311 Fixing screw

⇩ 〈Note〉 Tighten it lightly.

③ Projection lens assembling with the main body




Single or variable focus lens assembly

⇩

#219 Unit base

⇩

Fit the front cover plate #A2 into a groove on the unit base #219.

⇩ Ⓐ #515 ( after assembling the projection lens )

⇩ 〈Note〉 In case of Single focus lens, set the distance between the end of the projection lens tube #311 and the motor mounting tube #214 to 90.7 mm.

⇩ #303 Lens tube retaining metal

⇩ #304 Lens tube retaining rubber sheet

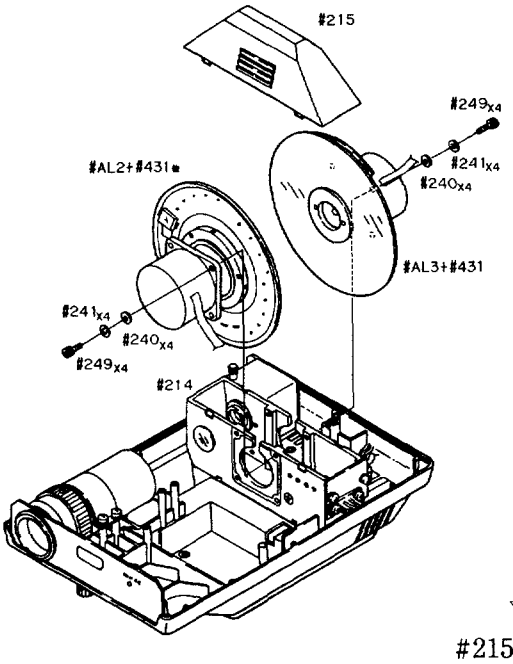
⇩ #320 ◎ plane washer 3 4 pcs.

⇩⇦ #319 ⊕ screw 3x6 4 pcs.

⇧ Ⓐ #350 (after tightening)

Use double number of parts for variable focus type

9) Assembling of the chart & mask assembly




#214 Motor mounting base

⇩

#AL2+431 & others Chart assembly

#AL3+431 Mask assembly

⇩ 〈Note〉 When assembling the chart and

⇩ mask assembly, do not hit the

⇩ motor mounting base #214 by

⇩ itself.

⇩ #241 ◎ spring washer 4 4 pcs.

⇩ #240 ◎ plane washer 4 4 pcs.

⇩⇦ #249 ◎ bolt 4x12 4 pcs.

⇧ Ⓐ #350 (after adjustment)

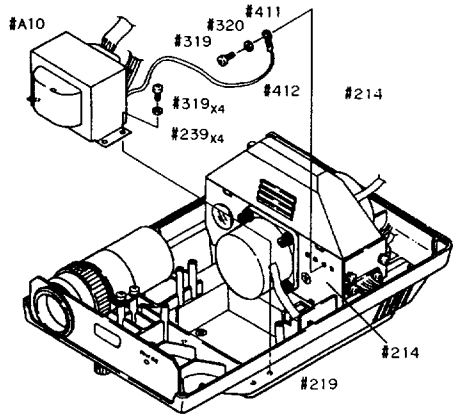
⇩

#215 Chart & mask block cover

⇩ 〈Note〉 Do not remove the cover to prevent

⇩ a dust until adjustment starts.

10) Transformer assembling




#219 Unit base

⇩

#A10 Transformer assembly

⇩ #219 ◎ plane washer 3 4 pcs.

⇩⇦ #319 ⊕ screw 3x6 4 pcs.

---

#214 Motor mounting base

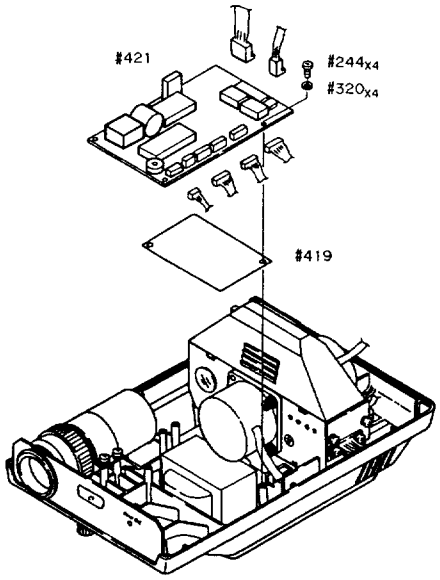
⇩

#411 Ring terminal

⇩ #320 ◎ plane washer 3 1 pc.

⇩⇦ #319 ⊕ screw 3x6 1 pc.

11) Control PC board




#219 Unit base

⇩

#421 CPU & memory PC board

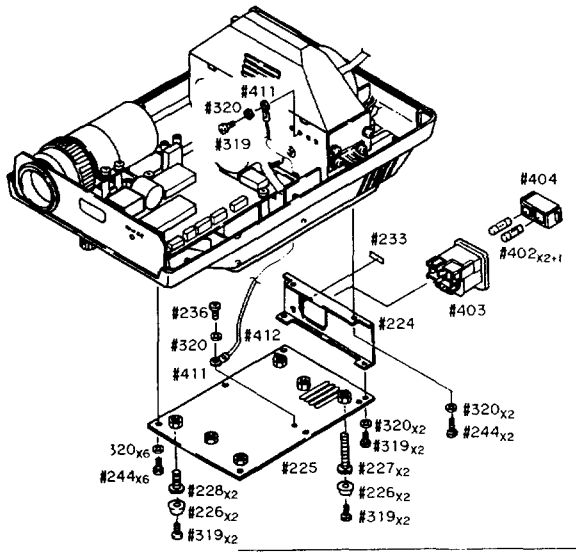
⇩ #419 Isolation sheet

⇩ #320 ◎ plane washer 3 1 pc.

⇩⇦ #244 ⊕ tapping screw ② 3x6 4 pcs.

Connect six connectors in proper position on PC board.

12) Bottom plate




#219 Unit base

⇩

#224 Electric board

⇩⇦ #223 Serial number label

⇩⇦ #403 AC connector

⇩⇦ #402 Fuse ( 1A, 250V ) 2 pcs.

⇩⇦ #404 Fuse holder cartridge

⇩ 〈Note〉 Do the wiring on fuse holder.

⇩ #320 ◎ plane washer 3 2 pcs.

⇩⇦ #244 ⊕ tapping screw ② 3x6 2 pcs.

⇧ Ⓐ #350 (after tightening)

Chart & mask block

⇩

#411 Round type terminal

⇩ #320 ◎ plane washer 3 1 pc.

⇩⇦ #319 ⊕ screw 3x6 1 pc.

#225 Bottom plate

⇩

#411 Round type terminal

⇩ #320 ◎ plane washer 3 1 pc.

⇩⇦ #236 ⊕ screw 3x4 1 pc.

⇧ Ⓐ #350 (after tightening)

[Fixing the bottom plate]

Unit base

⇩ #320 ◎ plane washer 3 2 pcs.

⇩⇦ #319 ⊕ screw 3x6 2 pcs.

⇧ 〈Note〉 Fix to the electric board #224.

⇧ Ⓐ #350 (after tightening)

⇩ #320 ◎ plane washer 3 6 pcs.

⇩⇦ #244 ⊕ tapping screw ② 3x6 6 pcs.

⇧ 〈Note〉 Fix to the unit base #219.

#228 Height adjuster (short) 2 pcs.

#227 Height adjuster (long) 2 pcs.

⇩ 〈Note〉 Just screw in.

#226 Rubber cushion 4 pcs.

⇩⇦ #319 ⊕ screw 3x6 4 pcs.

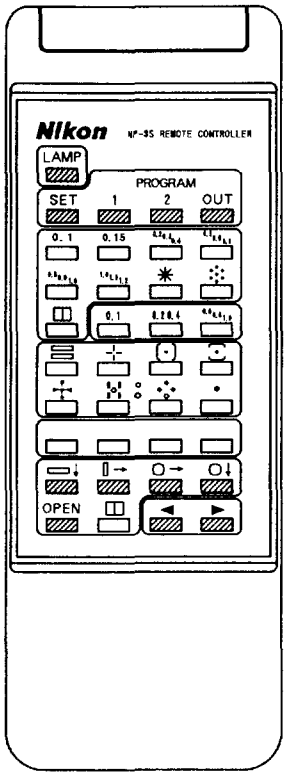
⇧ Ⓐ #350 (after tightening)

## 〔9〕 TEST Program

1) How to enter the Test program

(1) While holding to press the 『SET』 key, press the 『Out』 key.

(2) Then press the 『OPEN』 key to enter the Test program with beep sound. On the Test mode, Power saving function will not work.




2) Contents of the Test program

(1) 『0.1』 『400』 key • • •

Initialization of the Chart disc. When finished, sounds the beep.

(2) 『0.15』 『200』 key • • •

Initialization of the Mask disc. When finished, sounds the beep.

(3) 『0.2~0.4』 『100~70』 key • • •

Termination of the Test program. This key is valid on any mode.

(4) 『0.5~0.7』 『60~40』 key • • •

Acknowledgement of the ROM version by beeping.

(5) 『◁』 key • • •

One step (1.8 degree) decrement of the Chart disc.

(6) 『▷』 key • • •

One step (1.8 degree) increment of the Chart disc.

(7) 『□→』 key • • •

One step (1.8 degree) decrement of the Mask disc.

(8) 『□↓』 key • • •

One step (1.8 degree) increment of the Mask disc.

(9) Other keys • • •

No test function. If pressing the key, No reaction at all.

3) The details of the key's function • • •

(1) Initialization of the Chart disc.

① Press the 『0.1』 or 『400』 key on Test mode.

② When the stop mark on the Chart disc interrupts the Photo interrupter #422, the beep sounds according the status of the Pulse motor #431.

③ Adjust the motor positioning with the beep.

④ Return to the Normal mode by pressing 『0.2~0.4』 or 『100~70』 key.

(2) Initialization of the Mask disc.

① Press the 『0.15』 or 『200』 key on Test mode.

② When the stop mark on the Mask disc interrupts the Photo interrupter #422, the beep sounds according the status of the Pulse motor #431.

③ Adjust the motor position with the beep.

④ Return to the Normal mode by pressing 『0.2~0.4』 or 『100~70』 key.

(3) Acknowledgement of the ROM version

① Press the 『0.5~0.7』 or 『60~40』 key on Test mode.

② The beeping number indicates ROM version.

| ROM version | Beeping number |
|---|---|
| Ver. 1.2 | " Pi, Pi" twice |
| Ver. 1.3 | " Pi, Pi, Pi" three times |

③ Return to the Normal mode by pressing 『0.2~0.4』 or 『100~70』 key.

(4) Fine rotation of the Chart & mask disc.

① Press the 『◁』 or 『▷』 or 『□→』 or 『□↓』 key on Test mode.

② By pressing the 『◁』 or 『▷』 key the Chart disc rotates step by step.

『◁』 key : Decrement Rotates clockwise 1.8 degrees from the projection lens side view.

『▷』 key : Increment Rotates counterclockwise 1.8 degrees from the projection lens side view.

From initial chart 『0.1』 『400』 to No.1 optional chart,
8 steps equals one chart step.

From No.1 optional chart to initial chart 『0.1』 『400』
10 steps equals one chart step.

③ By pressing the 『□→』 or 『□↓』 key the Mask disc rotates step by step.

『□→』 key : Decrement Rotates clockwise 1.8 degrees from the projection lens side view.

『□↓』 key : Increment Rotates counterclockwise 1.8 degrees from the projection lens side view.

④ Return to the Normal mode by pressing 『0.2~0.4』 or 『100~70』 key.

## (10) Adjustment procedure

1) Positioning of the Halogen bulb (DXA30125)

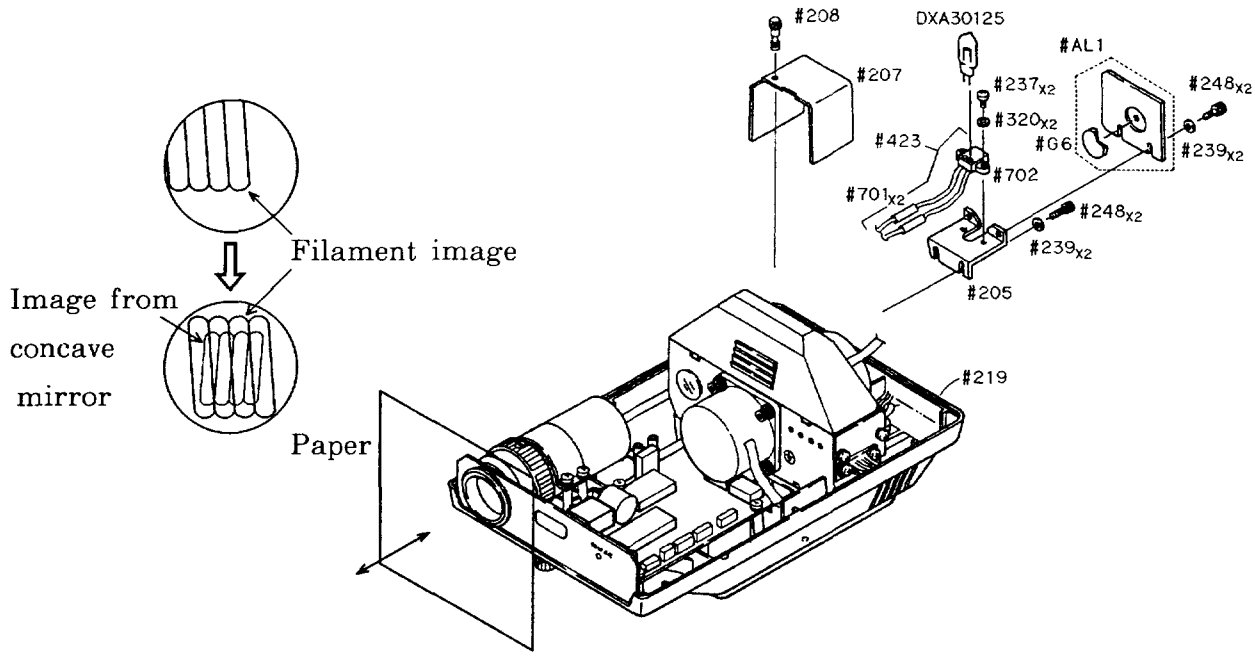
As the halogen lamp light on, take care you do not sear with lamp heat.

(1) Place the paper sheet in front of the projection lens to get the filament image.

(2) Loosen two ◎ 3x6 bolts #248 on the lamp housing bottom frame #205. The allen key can fit through the vertical slit on the back side of the base unit #219.

(3) Move the whole lamp housing horizontally and vertically to center the lamp filament image on the projection image. Be careful of the lamp heating.

(4) After positioning tighten two ◎ 3x6 bolts #248 and apply the glue (#350).




2) Positioning the concave face mirror assembly #AL1

As the halogen lamp light on, take care you do not sear with lamp heat.

(1) Loosen two ◎ 3x6 bolts #248 for the reflection mirror assembly #AL1 bonded the concave face mirror #G6.

(2) Move the reflection mirror assembly horizontally and vertically to center the small brighten lamp filament image reflected by the concave face mirror on the projection image. Be careful of the lamp heating.

(3) After positioning tighten two ◎ 3x6 bolts #248 and apply the glue (#350).

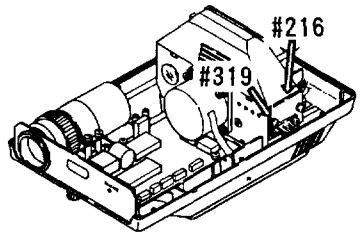
3) Positioning the sensor #422

(1) Do the job after confirming the follows.

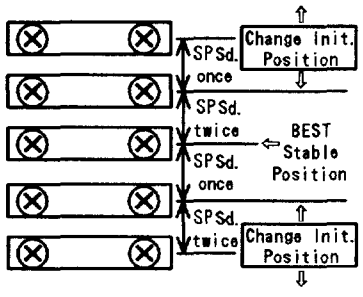
① The level of the top edge of the motor mounting base.

〈note〉 Adjust the level with the height adjusting legs #227 & #228.

② After adjustment apply the glue on screws for sensor.




Sensor Position




(2) Enter the TEST program with 『 SET 』 & 『 OUT 』 & 『 OPEN 』 keys.

(3) Initialize the Chart disc with 『 0.1 』 or 『 400 』 key.

(4) Cancel the inclination of the projected chart image by rotating the Chart motor itself.

〈note〉 Do the job by loosening four ◎ 4x12 bolts #249.

(5) Move the sensor retaining plate #216 fully upward by loosing two ◎ 3x6 bolts #319.

(6) Move the sensor retaining plate downward little by little until the beep at each initialization will be twice.

(7) Change the sensor moving distance to the half. Then tighten the screws #319 when changing the beep from twice to once.

《 Decision of the best stable position 》

(8) Do the Chart disc initialization several times, and make sure the chart inclination.

4) Adjustment of the Chart disc

As the Chart disc is supplied as a assembly which has been adjusted, no needs adjustment. Therefore, do the adjustment when you need especially.

(1) Repeat the following procedure for adjustment

① Initialize the Chart disc.

② Do the disc centering using a correction of the deviation between two chart which placed opposite each other. Do the adjustment on two direction.

③ Use four ◎■ 3x10 screws.

(2) List of the target chart recommended for adjustment

〔 List on next page 〕

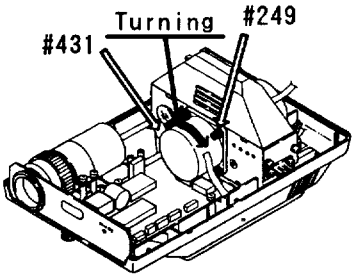
〔List of the target chart recommended for adjustment〕

| | | | | |
|---|---|---|---|---|
| Kana • landolt 1. 0 | ○ | | | |
| European multi 1. 0 | | | CD | |
| Number 1. 0 | ○ | | 58 | |
| Snellen 1. 0 | ○ | | CD | |
| Snellen • Number 20/20 | | | CD | |
| Multiple 20/20 | | | CD | |

5) Adjustment of the Mask disc

(1) Adjustment of the initialization position

① Enter the TEST program with 『SET』 & 『OUT』 & 『OPEN』 keys.




② Loosen four ◎ 4x12 bolts to make the mask motor rotatable.

③ Initialize the Mask disc with 『0.15』 or 『200』 key.

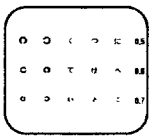
④ Rotate the Mask motor counterclockwise until the beep sounds twice when initializing.

⑤ Then rotate the Mask motor clockwise until the beep sounds once. And tighten four ◎ bolts.

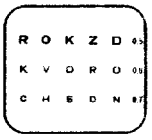
⑥ Do the Mask disc initialization several times, and make sure the beep sounds.

(2) Adjustment of the Mask position

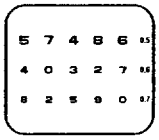
① Chart ( 0.5~0.7/60~40 ) list for adjustment



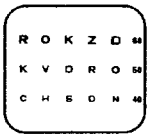
Kana • Landolt



European multi / Snellen



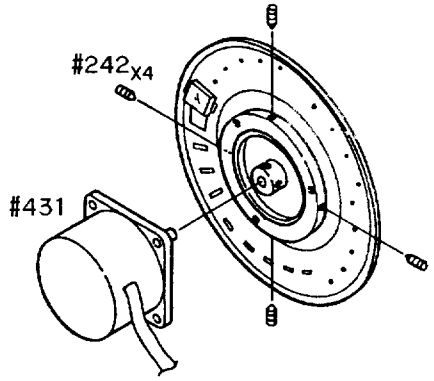
Number

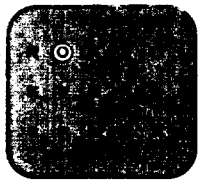


Snellen • Number /Multiple

② Set the test chart 0.5~0.7 (60~40) with the remote controller.

③ Check the mask position of upper second from the left and lower first from the right one-letter mask with the remote controller.



④ Correct the mask deviation with two ◎■ 3x10 screws #242.

⑤ After correction initialize again and make sure the mask position.

⑥ And then correct the mask deviation of the left vertical slit mask and the center one-letter mask with two ◎■ 3x10 screws #242.

⑦ At the end make sure the mask position after initializing.

• • • It is OK when the mask does not touch the letter.

6) Function and Set-up of the Dip-switch

(1) Function

① No.1 and No.2 - - - Signal combination of the controller interference.

② No.3 - - - ON and OFF the speaker sound.

③ No.4 - - - Battery switch for back-up.

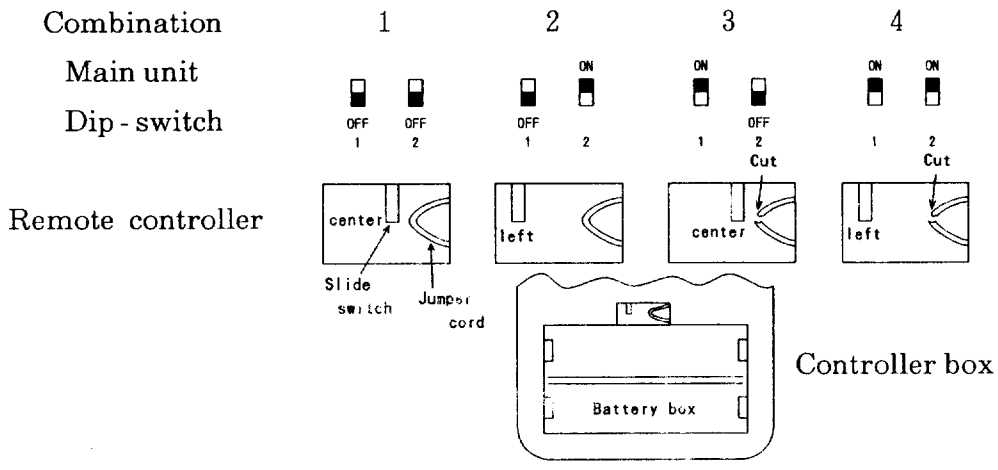
④ No.5, No.6 and No.7 - - - Selecting the chart installed.

⑤ No.8 - - - Setting the power saving mode.

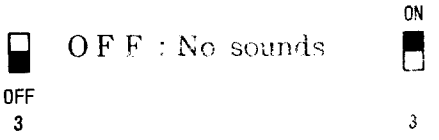
(2) Set-up and it's contents

① Signal combination of the controller interference

You may use four units operation by the Dip-switch and controller setting.

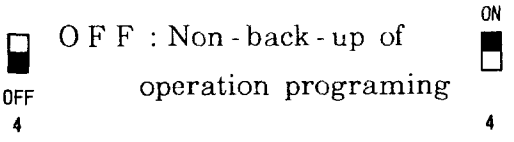


② ON and OFF the speaker sound




OFF : No sounds　　ON : Sounds

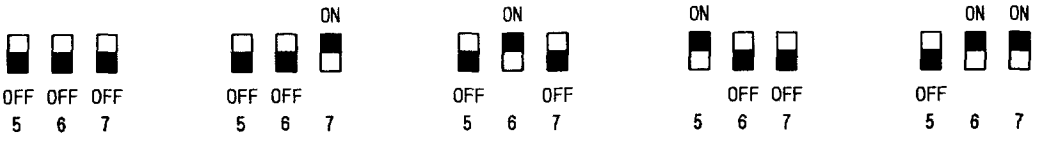
③ Battery switch for back-up




OFF : Non-back-up of operation programing　　ON : Do buck-up of opration programing

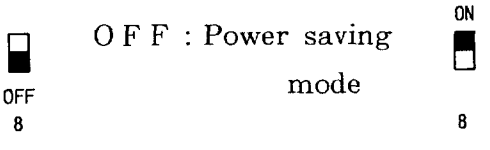
〈Note〉 Even if the setting is OFF, after power off the back-up function works for two or three minutes.

④ Selecting the chart installed




| Kana (DCA20900) | V-multiple (DCA20910) | Number (DCA20902) Snellen (DCA20903) | E-multiple (DCA20901) | Snellen/number (DCA20904) V-snellen/number (DCA20911) |
|---|---|---|---|---|

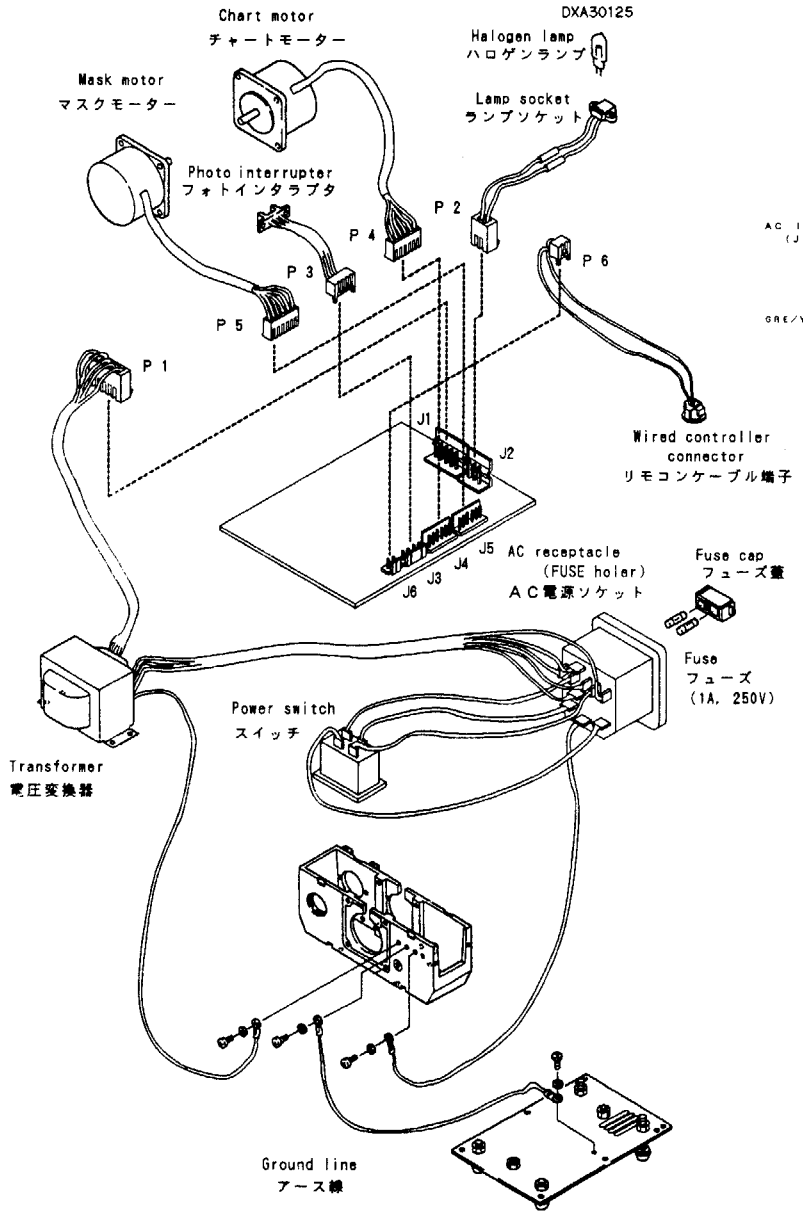
⑤ Setting the power saving mode

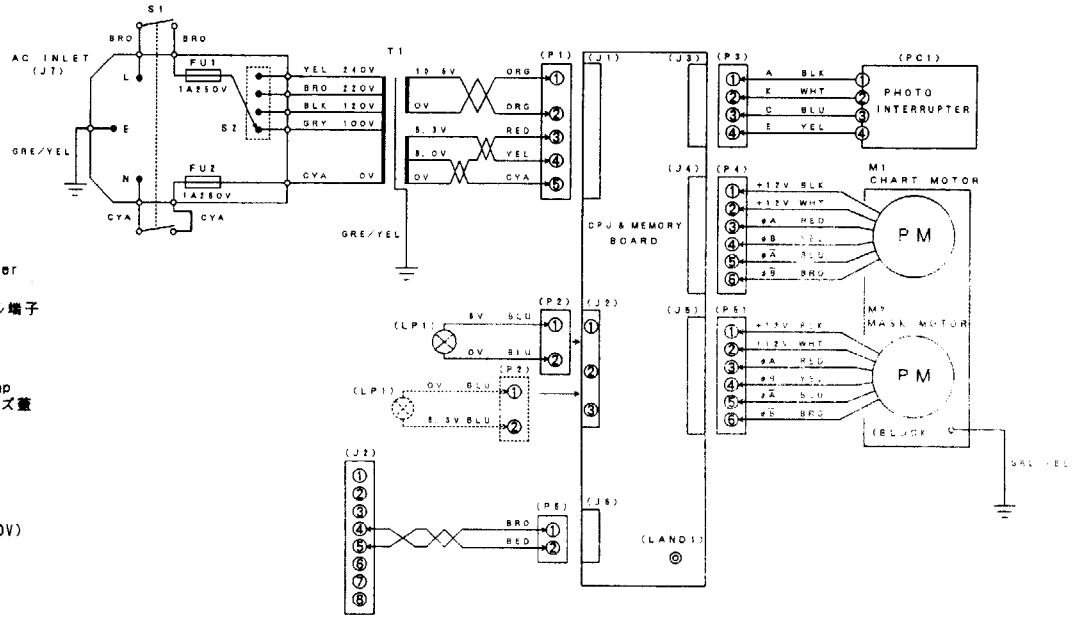



OFF : Power saving mode　　ON : Eliminate Power saving function

〈Note〉 Manufacturer setting is OFF.

〈Note〉 The life time is shortened by quitting the power saving mode. Please get a customers approval for quitting.




| 略字 Abbreviation | 色名 Color name | 略字 Abbreviation | 色名 Color name |
|---|---|---|---|
| RED | 赤 Red | CYA | 濃茶 Cyano |
| ORG | 橙 Orange | BLU | 青 Blue |
| YEL | 黄 Yellow | GRE | 緑 Green |
| BRO | 茶 Brown | WHT | 白 White |
| BLK | 黒 Black | GRE/YEL | 緑/黄 Green/Yellow |
| GRY | 灰 Grey | | |

# DCA20900·20901·20902·20903·20904·20910·20911